

<b>BROOKHAVEN NATIONAL LABORATORY</b> Safety & Health Services Division  <b>INDUSTRIAL HYGIENE GROUP</b> Standard Operating Procedure: Program Procedure	NUMBER <b>IH 75510</b>
	REVISION <b>FINAL rev 0</b>
Subject: INSTRUMENT OPERATION  <b>MIRAN 205B Series SapphIRE</b> <b>Single Gas/ Vapor Monitoring</b>	DATE <b>08/26/02</b>
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### **1.0 PURPOSE & SCOPE**

The purpose of this document is to provide a simple field procedure for operating the Miran 205B Series SapphIRE portable ambient air analyzer. With this document the user will be able to use the analyzer to capture environmental data and download all data collected for analysis. The procedure for operating the Miran 205B Series SapphIRE is based on the information provided in the operator guide.

This procedure provides a standardized method for monitoring ambient air in workplace environments to detect the presence of various gases. This SOP describes procedures to measure one gas only at a time (selected from the internal library). It should be used in conjunction with SOP IH 75180 Direct Reading Instruments, IH 60300 Chain of Custody Policy and Procedures and IH 60660 Program Procedures: Instrument Calibration and Maintenance Program.

### **2.0 RESPONSIBILITIES**

- 2.1 This program is implemented through the SHSD Industrial Hygiene Group Leader. Use of this SOP shall be limited to persons who act under the direction of a competent hazard assessment person.

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- 2.2 Persons using this procedure must have demonstrated competency to satisfactorily use this procedure and instrument to the satisfaction of the existing qualification criteria set by their organization. Personnel that perform monitoring with this procedure are responsible to follow all steps indicated.
- 2.3 Persons conducting testing are responsible to document results of the testing in compliance with these SOPs. The data collected using this instrument must have appropriate evaluation of the hazard and risk by a cognizant professional.
- 2.4 Persons using this method and their supervisor are responsible to ensure that the appropriate personal protective equipment is determined and worn while performing this procedure. In addition, the person performing the procedure and his/her supervisor are responsible to ensure that all required training and qualification for hazards that may be present in areas where this procedure will be used (such as respiratory protection or radioactive contamination) have been met.
- 2.5 The persons performing the procedure and their line supervisor are responsible to comply with all work planning and work permit system requirements.
- 2.6 The IH Group shall maintain the equipment used in this procedure.

### **3.0 DEFINITIONS**

- 3.1 ***Occupational Exposure Limit (OEL):*** The maximum time weighted average (TWA) exposure permitted for employee exposure, based on the lesser of the OSHA Permissible Exposure Limits (PEL) or ACGIH Threshold Limit Value (TLV). BNL follows the most protective OEL.
- 3.2 ***Program Administrator:*** A person designated by the IH Group Leader or SHSD management to administer this procedure and the associated program of data management.
- 3.3 ***Qualified Sampler:*** A person who has demonstrated competency, in accordance with Section 7, to perform this field procedure.

### **4.0 PREREQUISITES** Qualification as per Section 7

- 4.1 Do not perform work using this procedure without meeting the training and qualification requirements.
- 4.2 Training for entry into restricted areas may be required (check with ESH coordinator or FS Representative for the facility). Use appropriate PPE for the area.

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## **5.0 PRECAUTIONS**

- 5.1 **Hazard assessment:** The actual task of using the instrument typically does not cause significant employee health risks. The SapphIRe analyzer is intrinsically safe. It is incapable of causing ignition of a mixture of flammable or combustible material in air in its most easily ignitable concentration (as per NFPA Standard Number 493: *Intrinsically Safe Apparatus for use in Division 1 Hazardous Locations* 1978). This apparatus is suitable for use in Division 1 locations.
- 5.2 **Personal Protective Equipment:**
- 5.2.1 The operation of this analyzer does not require personal protective equipment.
  - 5.2.2 When the potential for exposure to airborne contaminants above the ACGIH TLV or STEL or OSHA PEL (which ever is lower) may occur in the area being sampled, the person collecting the sample must use appropriate respiratory protection in compliance with the BNL Respiratory Protection Program.
  - 5.2.3 When the potential for exposure to surface or airborne contaminants exist in the area being sampled, appropriate PPE for hands, feet, skin, head, or eyes may be needed for the area being entered. Check with your FS Representative or IH Group Supervisor.
- 5.3 **Radioactive Contamination:** It is possible that some areas to be tested may have radioactive contamination as well as other contamination. In these cases, personal protective equipment and administrative controls must be implemented for the radiological contaminant hazard in addition to the other hazards
- 5.4 **Work Planning:** All requirements of work permits and work planning system reviews must be met in performing this procedure.
- 5.5 **Environmental Impact and Waste Disposal:** This analyzer does not have adverse impact on the environment or generate hazardous wastes.

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## 6.0 PROCEDURE

### 6.1 Equipment:

- 6.1.1 Miran Sapphire Ambient Air Analyzer, Model 205B
- 6.1.2 Sample Wand
- 6.1.3 Zero Filter
- 6.1.4 Particulate Filter (HEPA)

### 6.2 Operate the analyzer as per this BNL Instrument Operation SOP.

#### 6.2.1 Preparation of the meter

- 6.2.1.1 Connect the wand to the analyzer by removing the protective cap from the analyzer inlet and outlet ports and connecting the flexible hose onto inlet port. Attach the connector to the other end of the hose. Attach the filter to the end of the connector. If you wish to use the optional leak probe, place it over the filter and slide the ring to tighten it in place.

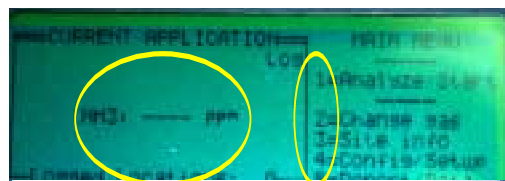


- 6.2.1.2 Press ON/OFF to get the *Main Menu*.  
NOTE: A warm up period of 20-30 minutes is suggested.
- 6.2.1.3 Perform a Battery Check prior to use. Press Control. “Battery” and the voltage are displayed in lower left hand corner. The Battery reading displays the hours and minutes left. A full battery usually lasts 4 hours.



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- 6.2.2 **Selecting the Analyte:** If the chemical you want to sample is pre-selected and shown on the *Main Menu*, press 1 and the display will then go to the *Zero Menu*. If not, press 2 to change the gas shown and select the gas. Select 1 to access the *Standard Library*. See Attachment 9.4 to see the library chemicals. Use the ^ and v keys to move to the correct chemical analyte in the library. Select the appropriate number corresponding the chemical you want to analyze for. The display will indicate that your entry is ACCEPTED and present the *Main Menu*.



- 6.2.3 Press 1 for *Analyze/Start*. This will take you to the *Zero Menu*. (If you press ENTER, you will skip the zeroing the meter.) Press 1 to set a new zero. See precautions in Attachment 9.1 on environmental conditions for setting the zero.
- 6.2.3.1 The display next prompts you to install the chemical (zero gas) filter on the connector. When you have done this, press ENTER.
- 6.2.3.2 Wait for the cell to fill with zero air and for the zeroing process to take place.
- 6.2.3.3 Then press ENTER to save the zero. The display responds “ZERO SAVED”.

- 6.2.4 **Sampling an area:** The display next prompts you to replace the chemical filter with the particulate filter. Then press ENTER. Wait for the cell to fill with sample. When completed, the display changes to the *Analysis Menu*. The active measurement is displayed on the left and the menu of selections on the right.



- 6.2.5 **Record Results:** Record the meter readings using a *Direct Reading Instrument Form* from SOP IH75180, other appropriate written mechanism, or data logging with print-out or electronic storage of the data (as per Steps 6.2.6 and 6.3).
- 6.2.6 **Logging Data:** The *Log function* saves measurement values for later downloading.
- 6.2.6.1 To begin the log function, press 1 (*Log*) from the analysis menu.
- 6.2.6.2 Press ENTER to save the log.
- 6.2.6.3 Press 1 to repeat the logging procedure.

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### 6.3 Downloading data

- 6.3.1 To print a report, connect your analyzer to any printer that can accept ASCII text format by connecting your printer cable to your analyzer parallel port.
- 6.3.2 From the *Main Menu*, press **5** (Report/Data) to access the *Report/Data Menu*. Then press **2** (print).
- 6.3.3 Press **1** from the *Print Menu*, to send data on the site selected to the printer.
- 6.3.4 To clear memory, press **4** from the *Report/Data Menu*. Press **1** to clear logged data. Press **2** if you want to clear all data.
- 6.3.5 The warning message "Clearing will erase stored data" is displayed. Press **Enter** to continue, press **esc** to cancel. When finished, the display responds "Cleared".
- 6.3.6 Press the **On/OFF** button to switch the unit off.

### 6.4 Results interpretation

- 6.4.1 A competent person should write a hazard evaluation report that evaluates the survey data and summarizes the potential for occupational exposure and compliance with OSHA and ACGIH Occupational Exposure Limits.
- 6.4.2 Ensure that a copy of the hazard evaluation report is sent to the IH Laboratory and is included in the ESHQ Directorate Recordkeeping system.
- 6.4.3 Ensure that a copy of the written hazard evaluation report documenting worker exposure is sent to the Occupational Medicine Clinic with the worker BNL Life Number noted.
- 6.4.4 The hazard evaluation report and/or *Employee Notification Form* (see IH 75140 Attachment 8.3) must be used to inform all monitored employees of the results of the air sampling and the implication to compliance with occupational exposure limits. Reporting to employees must be within the 15 days (BNL policy).
- 6.4.5 Complete an *IH Database Entry Form* and return to the IH laboratory.

## 7.0 IMPLEMENTATION AND TRAINING

- 7.1 Persons using this procedure must have demonstrated competency to satisfactorily use this procedure and instrument to the satisfaction of the existing qualification criteria set by their organization. Personnel that perform monitoring with this procedure are responsible to follow all steps indicated.
- 7.2 SHSD IH Group Personnel must demonstrate competency via Attachment 8.5.

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## **8.0 REFERENCES**

8.1 Miran 205B Series SapphIRe Portable Ambient Air Analyzer Instruction Manual.

## **9.0 ATTACHMENTS**

- 9.1 Measurement Principles
- 9.2 Assembling Wand and Filter
- 9.3 Controls and Display
- 9.4 Chemical in Analyzer Library

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## Attachment 9.1

# Measurement Principles

The SapphIRE analyzer contains a single beam infrared spectrophotometer. A microcontroller automatically controls the analysis, processes the measurement signal, and calculates the absorbance values. Analysis results can be displayed in parts per billion (ppb), parts per million (ppm), percent (%), mg/m<sup>3</sup>, or absorbance units (AU).

A rechargeable internal battery pack provides power for up to four hours of continuous operation. The system includes a separate charger/power supply which allows the analyzer to be powered from an ac supply. It is also used to recharge the battery pack either in an offline mode or while the analyzer is running in normal operating mode.

Calibration should be performed if you receive a prompt to calibrate which occurs after the analyzer has undergone 64 charge cycles without fully charging the battery or if the analyzer has gone unused for a period of 30 or more days.

The sapphire analyzer can be used either vertically (handle facing up) or horizontally (display facing up). Either position is acceptable for analysis. However, because of gravitational forces on the motor mechanism, which drives the wavelength system, the most stable position is horizontal. Thus, it is recommended that the unit be placed in the horizontal position when performing any analysis.

When zeroing the analyzer, it is important to zero the unit in the area where the analysis is to take place. This assures that the analyzer is zeroed with air (scrubbed by the zero gas filter) at the same temperature and humidity as the sample to be analyzed. For chemicals such as Butane, Carbon Dioxide, Carbon Monoxide, Ethane, Methane, Nitrous Oxide, Propane, and water vapor, that are not be scrubbed by the zero gas filter, it is important to zero the unit in an area free of the chemical.

The SapphIRE analyzer can be set to one of two pathlengths: short (0.5 m) and long (12.5 m). A message on the display reading Change Pathlength will occur depending on which gas the analyzer has been programmed for. To change the pathlength from the short to long, turn the hex recess adjustment clockwise with the push pin given. To change the pathlength from long to short, turn the hex recess adjustment counterclockwise.

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Changes in ambient humidity can significantly affect accuracy of the gas concentration. When humidity levels change from the zero time, the gas concentration can either rise or fall as those ambient levels rise and fall, respectively. For example, if you zero the analyzer in a 30% RH area and then take the analyzer into an 80% RH area, the reading for the gas will most likely rise.

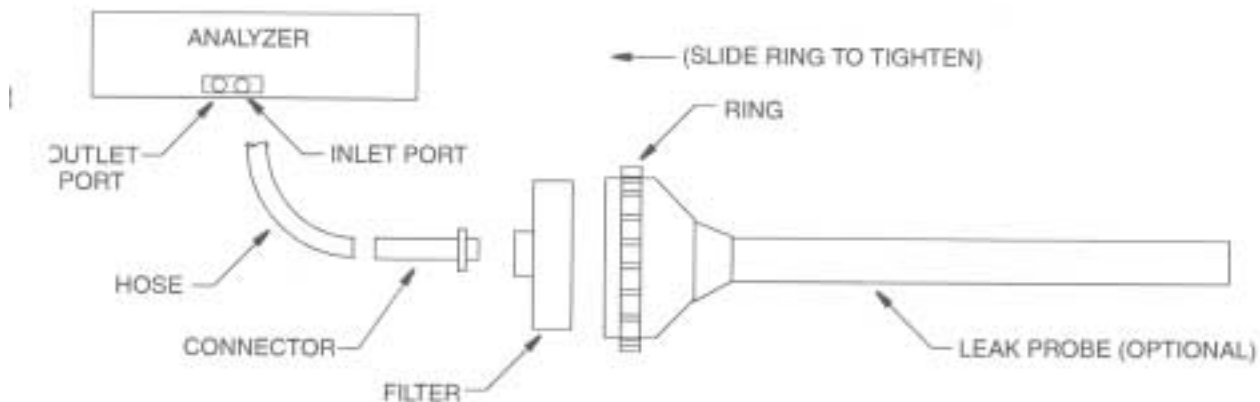
To compensate for this effect, the SapphIRE analyzer employs an analysis wavelength which is responsive to water vapor. The humidity compensation should be applied when the analyzer is being used as a continuous monitor since humidity levels can vary over the duration of the sampling period. The humidity compensation mode must be enabled for the correction to take place.

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## Attachment 9.2

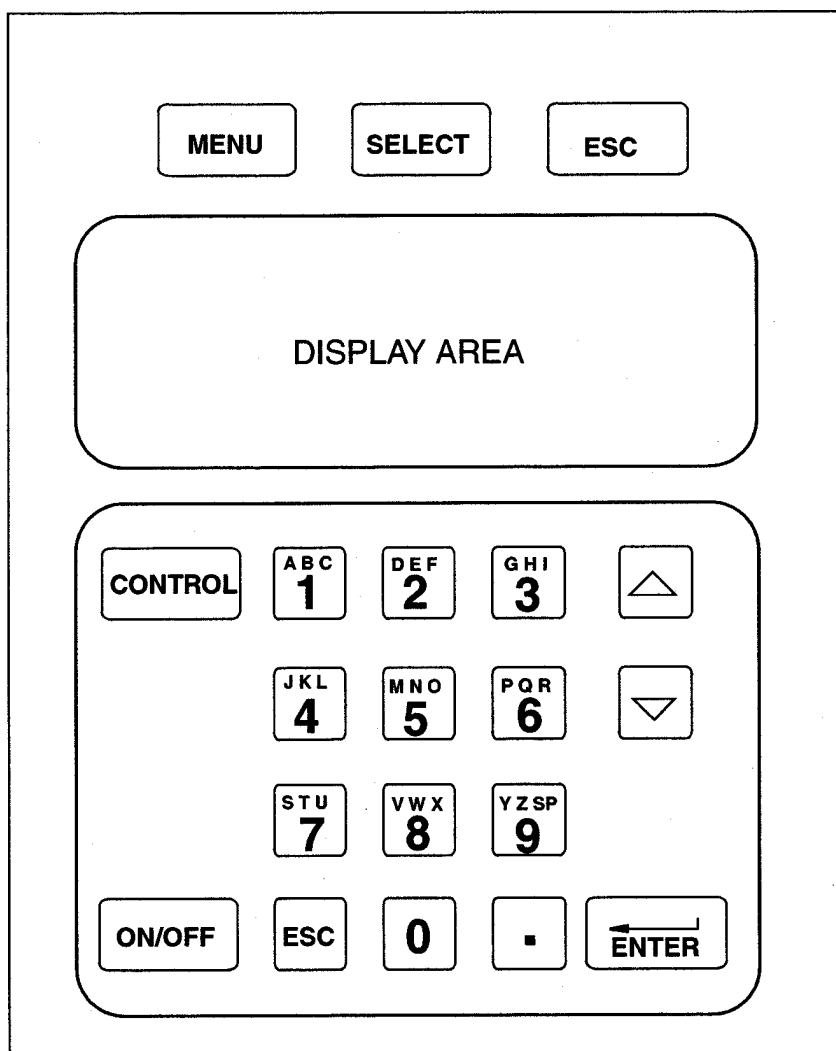
### Assembling Wand and Filter



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## Attachment 9.3 Controls & Display



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## Attachment 9.4

### Chemicals in the analyzer Library

COMPOUND	Applic Name 1	Library	Range		Detection Limit		Analytical Wavelength (mm)	Pathlength
			(ppm)	(mg/m3)	(ppm)	(mg/m3)		
ACETALDEHYDE	ACETALD	XL	400	722	0.8	1.4	9.14	Long
ACETIC ACID	ACETCAD	SL	100	246	0.5	1.2	10.20	Long
ACETIC ACID	ACETCAD	SL	30	74	0.15	0.4	8.64	Long
ACETONE	ACETONE	SL	2000	4760	5	11.9	8.40	Short
ACETONE	ACETONE	SL	2000	4760	5	11.9	11.04	Long
ACETONITRILE	ACETONIT	XL	500	841	11	18.5	9.69	Long
ACETOPHENONE	ACETOPHE	XL	100	492	0.4	2.0	8.11	Long
ACETYLENE	ACETYLEN	XL	200	213	0.5	0.5	13.72	Long
ACRYLONITRILE	ACRYLONI	XL	50	109	0.6	1.3	10.47	Long
AMMONIA	NH3	SL	500	349	0.7	0.5	10.87	Long
AMMONIA	NH3	SL	500	349	0.7	0.5	10.48	Long
ANILINE	ANILINE	XL	50	191	0.5	1.9	8.05	Long
BENZALDEHYDE	BENZALD	XL	500	2174	0.9	3.9	12.19	Long
BENZENE	BENZENE	SL	200	640	2	6.4	9.80	Long
1,3-BUTADIENE	13BUTADI	SL	100	222	0.7	1.6	10.03	Long
1,3-BUTADIENE	13BUTADI	SL	50	111	0.35	0.8	11.06	Long
BUTANE	BUTANE	XL	2000	4764	5	11.9	10.44	Long
n-BUTYL ACETATE	BUTLACET	XL	300	1428	0.18	0.9	9.67	Long
n-BUTYL ALCOHOL	BUOH n-	XL	200	607	0.25	0.8	9.57	Long
t-BUTYL ALCOHOL	BUOH t-	XL	100	304	0.3	0.9	8.44	Long
BUTYL CELLOSOLVE	BUTLCELL	SL	100	484	0.25	1.2	9.01	Long
t-BUTYL METHYL ETHER	MTBE	XL	50	280	0.15	0.8	9.28	Long
CARBON DIOXIDE (absolute)	CO2ABS	SL	1000	1804	1	1.8	4.25	Short
CARBON DIOXIDE (absolute)	CO2ABS	SL	1000	1804	30	54.1	14.00	Long

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CARBON DIOXIDE (differential)	CO2DIFF	SL	2000	3607	1.5	2.7	4.25	Short
CARBON DIOXIDE (differential)	CO2DIFF	SL	2000	3607	40	72.1	14.00	Long
CARBON DISULFIDE	CS2	XL	50	156	1	3.1	4.62	Long
CARBON MONOXIDE	CO	SL	250	287	0.9	1.0	4.62	Long
CARBON TETRACHLORIDE	CCL4-H	SL	100	630	0.05	0.3	12.66	Short
CARBON TETRACHLORIDE	CCL4-L	SL	5	32	1.2	7.6	12.66	Long
CELLOSOLVE	CELOSV-H	SL	500	1847	2.3	8.5	8.98	Short
CELLOSOLVE	CELOSV-L	SL	50	185	0.1	0.4	8.98	Long
CELLOSOLVE ACETATE	CLSLVAC	SL	200	1083	0.15	0.8	9.52	Long
CHLOROBENZENE	CLOROBEN	XL	150	692	0.4	1.8	9.33	Long
CHLOROBROMOMETHANE	CLBRMETH	XL	500	2651	0.4	2.1	8.32	Long
CHLOROFORM	CHCL3-H	SL	100	489	1.7	8.3	13.06	Short
CHLOROFORM	CHCL3-H	SL	100	489	0.5	2.4	8.37	Long
CHLOROFORM	CHCL3-L	SL	10	49	0.07	0.3	13.06	Long
CHLOROFORM	CHCL3-L	SL	10	49	0.5	2.4	8.37	Long
m-CRESOL	MCRESOL	SL	10	44	0.4	1.8	8.76	Long
CUMENE	CUMENE	XL	100	493	1	4.9	13.26	Long
CYCLOHEXANE	CYCLHEX	SL	500	1724	6	20.7	11.16	Long
CYCLOHEXANE	CYCLHEX	SL	500	1724	6	20.7	8.11	Long
CYCLOPENTANE	CYCLPENT	XL	500	1437	6	17.2	11.25	Long
DESFLURANE	DESFLR-H	SL	100	689	0.7	4.8	8.59	Short
DESFLURANE	DESFLR-H	SL	100	689	0.7	4.8	9.09	Short
DESFLURANE	DESFLR-L	SL	10	69	0.04	0.3	8.59	Long
DESFLURANE	DESFLR-L	SL	10	69	0.04	0.3	9.09	Long
m-DICHLOROBENZENE	MDICLBNZ	XL	150	904	0.35	2.1	12.84	Long
o-DICHLOROBENZENE	ODICLBNZ	XL	100	602	0.6	3.6	8.99	Long
p-DICHLOROBENZENE	PDICLBNZ	XL	150	904	0.25	1.5	9.28	Long
1,1-DICHLOROETHANE	11DICLOR	XL	200	811	0.4	1.6	9.55	Long
1,2-DICHLOROETHYLENE	12DICLOR	XL	500	1986	0.6	2.4	11.20	Long
DICHLOROETHYLETHER	2CLETH	XL	50	293	0.12	0.7	8.97	Long
DIETHYLAMINE	DIETHLAM	XL	50	150	0.35	1.0	8.90	Long
DIMETHYLACETAMIDE	DMAC	XL	30	107	0.4	1.4	8.59	Long

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DIMETHYLAMINE	DIMETHAM	XL	50	92	0.6	1.1	8.83	Long
N,N-DIMETHYLFORMAMIDE	DMF	XL	20	60	0.2	0.6	9.40	Long
DIOXANE	DIOXANE	XL	100	361	0.08	0.3	9.00	Long
ENFLURANE	ENFLRN-H	SL	100	756	0.6	4.5	8.90	Short
ENFLURANE	ENFLRN-H	SL	100	756	0.2	1.5	12.12	Long
ENFLURANE	ENFLRN-L	SL	10	76	0.03	0.2	8.90	Long
ENFLURANE	ENFLRN-L	SL	10	76	0.2	1.5	12.12	Long
ETHANE	ETHANE	XL	1000	1232	0.3	0.4	3.33	Long
ETHANOLAMINE	ETHNOLAM	XL	50	125	0.7	1.8	8.90	Long
ETHYL ACETATE	ETHYLACT	XL	500	1805	1.1	4.0	8.29	Short
ETHYL ALCOHOL	ETOH	XL	2000	3776	5	9.4	9.60	Short
ETHYL BENZENE	ETHYLBENZ	XL	200	870	1.2	5.2	13.52	Long
ETHYL CHLORIDE	ETHLCLOR	XL	1500	3966	1	2.6	10.39	Long
ETHYL ETHER	ETHYLETH	XL	500	1519	1.8	5.5	8.97	Long
ETHYL LACTATE	ETHLAC	SL	100	484	0.08	0.4	8.35	Long
ETHYLENE	ETHYLENE	XL	100	115	0.4	0.5	10.63	Long
ETHYLENE DICHLORIDE	ETHDICH	XL	100	406	0.7	2.8	8.30	Long
ETHYLENE OXIDE	ETO	SL	100	181	0.35	0.6	11.65	Long
ETHYLENE OXIDE	ETO	SL	100	181	0.6	1.1	3.33	Long
FORMALDEHYDE	FORMALD	SL	10	12	0.11	0.1	3.57	Long
FORMIC ACID	FORMIC	XL	30	57	0.12	0.2	9.17	Long
GEN HALOCARBONS (Chloroform)	GENHAL-H	SL	100	489	1.7	0.3	13.06	Short
GEN HALOCARBONS (Chloroform)	GENHAL-L	SL	10	49	0.07	8.3	13.06	Long
GEN HYDROCARBONS (Hexane)	THCHEX	SL	500	1766	0.25	1.1	3.33	Long
GEN HYDROCARBONS (Methane)	THCMETH	SL	20	13	1.5	1.0	3.33	Long
HALOTHANE	HALTHN-H	SL	100	809	1.5	12.1	12.37	Short
HALOTHANE	HALTHN-H	SL	100	809	0.09	0.7	8.97	Long
HALOTHANE	HALTHN-L	SL	10	81	0.25	2.0	12.37	Long
HALOTHANE	HALTHN-L	SL	10	81	0.09	0.7	8.97	Long
HEPTANE	HEPTANE	XL	1000	4107	10	41.1	10.77	Long
n-HEXANE	HEXANE	XL	500	1766	0.25	0.9	3.33	Long
HYDRAZINE	HYDRAZIN	XL	50	66	0.8	1.1	10.84	Long

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ISOBUTANE	ISOBUTAN	XL	250	595	2.5	6.0	8.68	Long
ISOFLURANE	ISOFLR-H	SL	100	756	0.7	5.3	8.80	Short
ISOFLURANE	ISOFLR-H	SL	100	756	0.5	3.8	11.37	Long
ISOFLURANE	ISOFLR-L	SL	10	76	0.04	0.3	8.80	Long
ISOFLURANE	ISOFLR-L	SL	10	76	0.5	3.8	11.37	Long
ISOPROPYL ALCOHOL	IPA-H	SL	1000	2463	10	24.6	10.59	Short
ISOPROPYL ALCOHOL	IPA-H	SL	1000	2463	4	9.9	12.30	Long
ISOPROPYL ALCOHOL	IPA-L	SL	100	246	0.5	1.2	10.59	Long
ISOPROPYL ALCOHOL	IPA-L	SL	100	246	0.3	0.7	8.85	Long
ISOPROPYL ETHER	IPETHER	XL	1000	4187	3	12.6	9.04	Short
METHANE	METHANE	SL	100	66	1.5	1.0	3.33	Long
METHYL ACETATE	METHACET	SL	500	1518	1.3	3.9	8.20	Short
METHYL ACETATE	METHACET	SL	500	1518	6	18.2	9.64	Short
METHYL ACRYLATE	METHACRY	XL	20	71	0.07	0.2	8.49	Long
METHYL ALCOHOL	MEOH	XL	500	656	0.7	0.9	10.22	Long
METHYL CELLOSOLVE	MCELLO	SL	100	312	0.15	0.5	9.50	Long
METHYL CELLOSOLVE ACETATE	MCELOA	SL	100	484	0.14	0.7	8.92	Long
METHYL CELLOSOLVE ACETATE	MCELOA	SL	100	484	0.15	0.7	9.52	Long
METHYL CHLORIDE	MECL	XL	200	414	1.7	3.5	13.51	Long
METHYL CHLOROFORM	111TRICL	XL	500	2734	0.15	0.8	9.38	Long
METHYL ETHYL KETONE	MEK	SL	1000	2955	7	20.7	8.69	Short
METHYL ETHYL KETONE	MEK	SL	1000	2955	1.6	4.7	10.68	Long
METHYL ISOBUTYL KETONE	MIBK	XL	100	410	0.35	1.4	8.71	Long
METHYL METHACRYLATE	METHMACR	SL	250	1026	0.4	1.6	10.75	Long
METHYL METHACRYLATE	METHMACR	SL	250	1026	0.7	2.9	12.28	Long
METHYLACETYLENE	MACETYLN	XL	1000	1643	1.2	2.0	8.16	Long
METHYLAMINE	METHAMIN	XL	50	64	0.6	0.8	12.91	Long
METHYLENE CHLORIDE	MECL2	SL	200	696	4	13.9	13.32	Short
NITROGEN TRIFLUORIDE	NF3	XL	50	145	0.04	0.1	11.11	Long
NITROUS OXIDE	N2O	SL	100	180	0.04	0.1	4.50	Long
OCTANE	OCTANE-H	XL	1000	4681	5	23.4	3.33	Short
OCTANE	OCTANE-L	XL	100	468	0.35	1.6	3.33	Long



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PENTANE	PENTANE	XL	2000	5913	6	17.7	11.06	Long
PERCHLOROETHYLENE	PERC-H	SL	500	3398	2	13.6	11.01	Short
PERCHLOROETHYLENE	PERC-L	SL	50	340	0.09	0.6	11.01	Long
PERCHLOROETHYLENE	PERC-L	SL	50	340	0.4	2.7	12.88	Long
PGMEA	PGMEA	XL	50	271	0.07	0.4	8.20	Long
PHOSGENE	PHOSGENE	XL	5	20	0.05	0.2	11.88	Long
PROPANE	PROPANE	XL	2000	3614	20	36.1	13.44	Long
n-PROPANOL	PROPOH	XL	500	1231	0.6	1.5	10.39	Long
PROPYLENE OXIDE	PROPOXID	XL	200	476	0.7	1.7	12.04	Long
PYRIDINE	PYRIDINE	XL	100	324	1.5	4.9	9.81	Long
TRICHLOROMONOFUOROMETHANE	R11	XL	1000	5630	1	5.6	10.80	Long
TRICHLOROTRIFLUOROETHANE	R113	SL	1000	7679	1.7	13.1	11.11	Short
TRICHLOROTRIFLUOROETHANE	R113	SL	1000	7679	2.5	19.2	9.72	Short
1,2-DICHLOROTETRAFLUROETHANE	R114	SL	1000	7005	2	14.0	9.67	Short
1,2-DICHLOROTETRAFLUROETHANE	R114	SL	1000	7005	1.5	10.5	11.90	Short
DICHLORODIFLUOROMETHANE	R12	SL	1000	4955	1.4	6.9	10.94	Short
DICHLORODIFLUOROMETHANE	R12	SL	1000	4955	1.5	7.4	9.21	Short
DICHLOROTRIFLUOROETHANE	R123-H	SL	200	1253	1.3	8.1	8.55	Short
DICHLOROTRIFLUOROETHANE	R123-H	SL	200	1253	1.5	9.4	13.12	Long
DICHLOROTRIFLUOROETHANE	R123-L	SL	10	63	0.07	0.4	8.55	Long
DICHLOROTRIFLUOROETHANE	R123-L	SL	10	63	0.09	0.6	8.88	Long
1-CHLORO-1,1,2,2-TETRAFLUROETHANE	R124-H	SL	500	2797	1.4	7.8	8.47	Short
1-CHLORO-1,1,2,2-TETRAFLUROETHANE	R124-H	SL	500	2797	3	16.8	11.40	Short
1-CHLORO-1,1,2,2-TETRAFLUROETHANE	R124-L	SL	100	559	0.05	0.3	8.47	Long
1-CHLORO-1,1,2,2-TETRAFLUROETHANE	R124-L	SL	100	559	0.2	1.1	11.40	Long
1,1,1,2-TETRAFLUROETHANE	R134A	XL	200	836	0.17	0.7	9.24	Long
BROMOTRIFLUOROMETHANE	R13B1	XL	1000	6102	1	6.1	9.40	Short
1,1-DICHLORO-1-FLUROETHANE	R141B	XL	200	959	0.17	0.8	10.89	Long
1,1,1-TRIFLUOROETHANE	R143a	XL	25	87	0.05	0.2	8.31	Long
1,1-DIFLUOROETHANE	R152a	XL	25	68	0.06	0.2	8.97	Long
DICHLOROFLUOROMETHANE	R21	SL	1000	4218	2	8.4	9.45	Short
DICHLOROFLUOROMETHANE	R21	SL	1000	4218	1.5	6.3	12.52	Short

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CHLORODIFLUOROMETHANE	R22	SL	1000	3544	1	3.5	9.14	Short
CHLORODIFLUOROMETHANE	R22	SL	1000	3544	2.5	8.9	12.45	Short
DICHLOROPENTAFLUOROPROPANE	R225	XL	100	404	0.1	0.4	9.19	Long
SEVOFLURANE	SEVFLN-H	SL	100	820	0.7	5.7	8.31	Short
SEVOFLURANE	SEVFLN-L	SL	10	82	0.03	0.2	8.31	Long
STYRENE	STYRNE-H	SL	1000	4268	15	64.0	11.08	Short
STYRENE	STYRNE-L	SL	200	854	0.6	2.6	11.08	Long
STYRENE	STYRNE-L	SL	200	854	0.7	3.0	12.98	Long
SULFUR DIOXIDE	SO2	SL	30	79	1.2	3.2	8.78	Long
SULFUR HEXAFLUORIDE	SF6	SL	4	24	0.01	0.1	10.71	Long
SULFURYL FLUORIDE	SULFRYLF	XL	30	125	0.1	0.4	11.55	Long
TETRAHYDROFURAN	THF	XL	500	1478	0.5	1.5	8.66	Long
TOLUENE	TOLUEN-H	SL	1000	3776	18	68.0	13.84	Short
TOLUENE	TOLUEN-H	SL	1000	3776	4	15.1	9.40	Long
TOLUENE	TOLUEN-L	SL	200	755	1	3.8	13.84	Long
1,1,2-TRICHTHLORETHANE	3CLETHAN	XL	30	164	0.25	1.4	13.58	Long
1,1,2,2-TETRACHLOROETHANE	4CLETHAN	XL	20	138	0.25	1.7	12.45	Long
TRICHTHLORETHYLENE	TCE	SL	1000	5384	4	21.5	10.76	Short
TRICHTHLORETHYLENE	TCE	SL	1000	5384	4	21.5	11.88	Short
VINYL ACETATE	VINLACET	XL	10	35	0.04	0.1	8.35	Long
VINYL CHLORIDE	VINLCLOR	SL	20	51	0.6	1.5	10.72	Long
VINYL CHLORIDE	VINLCLOR	SL	20	51	1.6	4.1	9.79	Long
VINYLDIENE CHLORIDE	VINLIDCL	XL	20	79	0.2	0.8	12.69	Long
XYLENE	XYLENE-H	SL	2000	8702	30	130.5	13.13	Short
XYLENE	XYLENE-H	SL	2000	8702	7	30.5	12.60	Long
XYLENE	XYLENE-L	SL	200	870	1.3	5.7	13.13	Long

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1. The SapphIRe DL contains no standard library compounds. The SapphIRe SL contains all compounds noted as "SL" under library. The SapphIRe XL contains all compounds in this list.
2. Accuracy specifications application from 5 times the detection limit to the High Range Limit (Measurement Range).
3. Detection limit is the point at which the analyzer will consistently and repeatably detect the presence of the subject gas.
4. Accuracy of SF6 application is 10% up to 1.0 PPM, and 20% from 1.0 - 4.0 PPM
5. "UR" in accuracy column indicates that the accuracy calculations are still being performed.